IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Schmitt, et al.	§	
Serial No.: 10/812,717	§	Group Art Unit: 1709
Confirmation No.: 3736	§	Examiner: Lafond, Ronald D.
Filed: March 29, 2004	§	
For: Deposition of Low Dielectric Constant by N_2O addition	§	

MAIL STOP AMENDMENT
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

DECLARATION UNDER 35 C.F.R § 1.131

I, Francimar C. Schmitt, in support of conception and reduction to practice of claimed subject matter prior to filing of the present application on March 29, 2004, hereby declare:

1. I am a co-inventor with Kimberly A. Branshaw, Padmanabhan Krishnaraj and Hichem M'Saad, of the subject matter described and claimed in the present application filed on March 29, 2004. I have read and understand the application, including the currently pending claims;

2. We conceived of the subject matter of all claims pending in this application in the United States prior to October 16, 2003, the publication date of U.S. Patent Publication No. 2003/0194495 published to *Li, et al* , hereinafter referred as the "*Li*";

3. Our conception of the claimed subject matter of the pending claims prior to October 16, 2003, is evidenced by Exhibit A1, which is a graph illustrating film dielectric constants deposited by different ratios of nitrogen atom to OMCTS precursor, and by

Exhibit A2, which is an Excel spreadsheet regarding experimental conditions utilized, for deposing a low dielectric constant film using a cyclic organosiloxane and two or more oxidizing gases comprising N_2O and O_2, wherein a ratio of a flow rate of the N_2O to a total flow rate of the two or more oxidizing gases is between about 0.1 and about 0.5;

4. The spreadsheet of Exhibit A1 and A2 was prepared prior to October 16, 2003. The selected experimental conditions listed in Exhibit A2 correspond to the measurement data shown in Exhibit B and Exhibit C. The test runs listed on Exhibit A2 is identified on Exhibit B and Exhibit C by their film thickness, showing that the experiments were conducted prior to October 16, 2003.

5. The experiments reported in the Excel spreadsheet shown in Exhibit A2 show actual reduction to practice in the United States of the claimed subject matter prior to October 16, 2003;

6. That all experiments resulting in the data reported in the Excel spreadsheet shown in Exhibit A2 were performed in the United States;

7. The experiment labeled as FSN-18 in Exhibit A2 utilized a N_2O to a total flow ratio of 0.1714. The resultant film had a low dielectric constant of 2.82 and a thickness of 11375 Å. The measurement was completed prior to October 16, 2003, as shown in the first row of measurement data illustrated in Exhibit B;

8. The experiment labeled as FSN-17 in Exhibit A2 utilized a N_2O to a total flow ratio of 0.3158. The resultant film had a low dielectric constant of 2.80 and a thickness of 11582 Å. The measurement was completed prior to October 16, 2003, as shown in the second row of measurement data illustrated in Exhibit B;

9. The experiment picked in the data line immediately under labeled FSN-17 in Exhibit A2 utilized a N_2O to a total flow ratio of 0.4762. The resultant film had a low dielectric constant of 2.81 and having a thickness of 8145 Å. The measurement was completed prior to October 16, 2003, as shown in substrate measurement map illustrated in Exhibit C;

10. Thus, the data obtained prior to October 16, 2003, illustrates the use of a organosiloxane and a N_2O to total flow rate of between about 0.1 and about 0.5 for depositing a low dielectric constant film.

11. We diligently pursued the subject matter of the pending claims from a time

beginning before October 16, 2003 until filing of the present application on March 29, 2004.

I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further, that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Date: 9/25/07

Francimar C. Schmitt

Exhibit A1

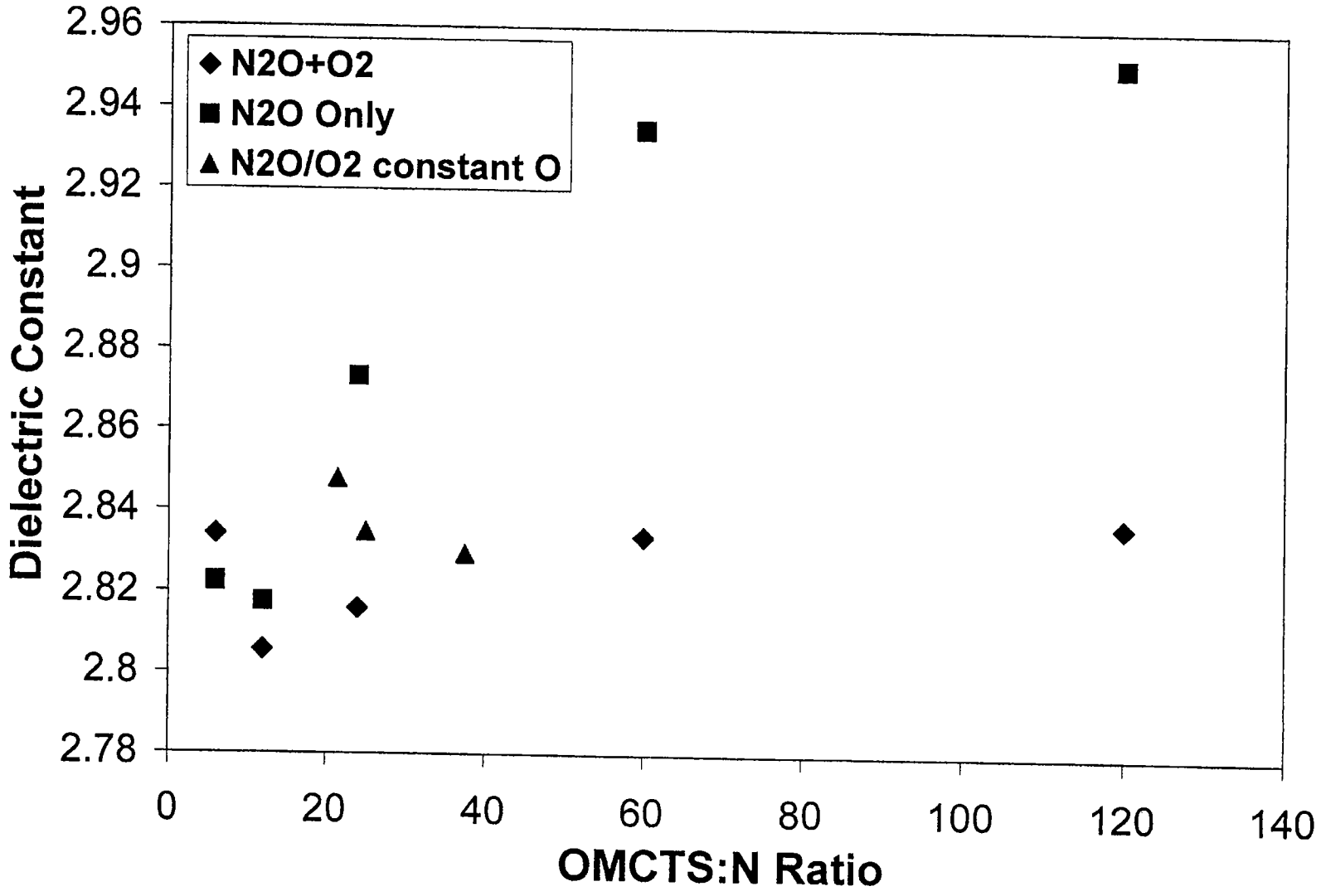


Exhibit A1

Exhibit A2

slot	recipe	As-Dep N2O	O2		DT	Thick	DR	Range	Unif	RI	CPT Thick	Cap	K	Stress	mod
17	FSN-1	1000	160		78	15217	11705	2125	3.66	1.396	13035.16	42.33	2.83	42.36	4.741
11	FSN-2	500	160		78	11852	9117	3068	8.94	1.405	10048.39	54.36	2.81	27.66	5.181
9	FSN-3	250	160		78	9475	7288	2220	6.92	1.411	8052	66.09	2.82	20.95	5.062
7	FSN-4	100	160		78	8423	6479	1639	5.55	1.415	7397.25	74.59	2.83	17.41	6.13
5	FSN-5	50	160		78	8115	6242	1196	4.49	1.416	7373.48	74.91	2.84	17.73	6.587
7	FSN-6	1000	0		78	13453	10348	817	1.82	1.410	12277.86	44.76	2.82	27.5	4.591
		700	0		84	12613	9009		3.36	1.423	11401.82	48.23	2.82	22.51	
		600	0		84	11592	8280		2.86	1.428	10675.07	51.53	2.82	19.02	
5	FSN-7	500	0		78	9765	7512	826	2.13	1.432	9284.03	59.09	2.82	15.1	6.131
3	FSN-8	250	0		78	7835	6027	552	2.05	1.448	7738.58	72.29	2.87	8.35	7.168
1	FSN-9	100	0		78	6784	5219	837	4.52	1.468	7040.13	81.17	2.93	5.668	9.535
23	FSN-10	50	0		78	6513	5010	821	4.61	1.478	6790.61	84.62	2.95	7.169	9.771
3	FSN-11	0	160	0	78	7774	5980	965	3.42	1.420	7156.1	77.84	2.86	20.1	
9	FSN-11	0	160	0	78	7799	5999	1097	3.55	1.420	7110.81	78.19	2.86	24.95	7.78
	FSN-18	30	145	0.1714	110	11375	6205	1656	3.36	1.421	10571	52	2.82	33.33	
	FSN-17	60	130	0.3158	110	11582	6317	1490	3.72	1.423	10517	51.91	2.80	30.62	
		100	110	0.4762	78	8145	6265	1368	4.95	1.422	7214.62	75.99	2.81	21.17	
13	FSN-12	160	80	0.6667	78	8150	6270	1470	5.08	1.428	7249.39	75.99	2.83	17	6.23
15	FSN-13	240	40	0.8571	78	8226	6328	1028	3.1	1.435	7621.72	72.41	2.83	16	6.28
19	FSN-14	280	20	0.9333	78	8273	6364	881	1.89	1.439	7888.35	70.29	2.85	12.52	6.19
21	FSN-15	280	20	0.9333	78	8066	6204	991	2.66	1.439	7494.39	73.96	2.85	1.97	

slot	recipe	EBK N2O	O2	DT	Thick	DR	Range	Unif	RI	CPT Thic	Cap	K	Stress	thick delta	shrink%	shrinkU%	
17	FSN-1	1000	160		15063		2142.9		1.4296	12876	42.156	2.79	50.34	153.8	1.01	7.61	5.416
11	FSN-2	500	160		11719		3052.8		1.4092	9917	54.209	2.76	38.29	132.04	1.11	7.48	5.607
9	FSN-3	250	160		9362		2209		1.4113	7953.1	67.662	2.76	35.37	112.53	1.19	16.44	5.969
7	FSN-4	100	160		8326		1680.9		1.4122	7288.3	74.009	2.77	34.05	97.58	1.16	14.31	6.774
5	FSN-5	50	160		8019		1194.7		1.417	7283.7	74.639	2.79	34.99	96.14	1.18	11.14	7.178
7	FSN-6	1000	0		13385			1.85	1.4076	12167	44.494	2.78	36.45	88.83	0.66	18	4.065
5	FSN-7	500	0		9709			2.24	1.4291	9218.2	58.635	2.78	29.66	55.91	0.57	27.73	6.72
3	FSN-8	250	0		7821			2.04	1.4412	7718.4	71.588	2.84	26.3	13.53	0.17	47.67	7.451
1	FSN-9	100	0		6754			4.51	1.4629	7002.8	80.59	2.90	24.78	30.36	0.45	13.83	9.302
23	FSN-10	50	0		6481		809.13		1.4337	6750.7	84.066	2.92	29.46	32.34	0.50	23.56	10.296
3	FSN-11	0	160		7678		980.12		1.4141	7050.6	77.44	2.80	36.97	96.37	1.24	8.27	8.33
9	FSN-11	0	160		7709			3.64	1.4175	7016.3	75.639	2.80	39.3	91.07	1.17	8.11	8.33
13	FSN-12	160	80		8098		1471.8		1.4038	7184.5	75.264	2.78	24.75	52.11	0.64	13.81	6.855
15	FSN-13	240	40		8194		1008.3		1.4229	7590.6	71.613	2.79	25.32	32.29	0.39	26.34	6.897
19	FSN-14	280	20		8243		675.04		1.3952	7862.6	69.483	2.81	32.46	29.75	0.36	26.41	7.362
21	FSN-15	280	20		8040		981.7		1.4339	7467.2	73.363	2.81	21.97	24.8	0.31	29.78	

C2H4 As-Dep Flow Splits (80O2/160N2O)

	C2H4	thick	DT	DR	range	unif	cpthick	cap	k	stress	M	H
	0	10214.3	95.7	6404	2069	5.05	9048	60.44	2.82	13.420		
12F	3000	5617.31	95.7	3522	666	3.31	6916	95.79	2.92	-22.070		
12E	2000	6283.26	95.7	3939	813	3.33	6740	82.49	2.87	-6.158		
12D	1000	7636.28	95.7	4788	586	2.03	7878	69.44	2.82	7.154	6.118	0.881
12C	750	8170.3	95.7	5122	478	1.5	8216	66.04	2.80	10.490	5.633	0.807
12B	500	8802.12	95.7	5519	534	1.54	8659	62.76	2.80	12.960	5.379	0.774
12A	250	9592.04	95.7	6014	1089	2.82	9174	59.08	2.79	14.980	3.839	0.389

C2H4 Post EBK Flow Splits (80O2/160N2O)

	C2H4	thick	Del thick	shrink	shrinkU	range	unif	RI	cpthick	cap	k	stress				
	0	10142	63.1	0.6178	51.85	1795	4.99	1.4237	8985	59.91	2.77	28.770				
12F	3000	5611	3.92	0.0698	566.8	698	3.6	1.4695	5916	94.744	2.88	2.522			2.79	50.34
12E	2000	6263	16.81	0.2675	143.8	855	3.49	1.4545	6726	81.541	2.82	16.250			2.76	38.29
12D	1000	7621	10.79	0.1413	310.5	674	2.35	1.4321	7884	68.662	2.78	25.000	6.298	0.928	2.76	35.37
12C	750	8143	16.04	0.1963	164.1	618	1.81	1.4295	8216	65.311	2.76	27.510	5.979	0.872	2.77	34.05
12B	500	8744	53.22	0.6046	58.99	543	1.57	1.432	8825	61.838	2.74	28.920	5.839	0.856	2.79	34.99
12A	250	9512	76	0.7923	55.73	964	2.78	1.4302	9123	58.66	2.75	29.600	6.337	0.944		
												2.78	36.45			
												2.78	29.66			

N2O Process Window for Lower K check

spacing	thick	DT	DR	range	unif	RI	cpthick	cap	k	stress
450	8150	78	6270	1470	5.08	1.428			2.83	6
475	10724.2	100	6435	1697.12	4.29	1.425	9612	56.859	2.81	16.05
500	10641.1	100	6505	1576.13	3.89	1.423	9825	55.734	2.82	12.92
pres										
5	8150	78	6270	1470	5.08	1.428			2.83	6
5.5	10637	100	6382	1970.16	5.21	1.423	9422	57.635	2.79	12.77
6	10638.7	100	6383	2065.54	5.64	1.419	9421	56.959	2.76	17.19
RF										
500	8150	78	6270	1470	5.08	1.428			2.83	6
475	10415.2	100	6249	1761.44	4.69	1.426	9335	58.385	2.80	14.75
450	10173.6	100	6104	1745.08	4.7	1.424	9085	59.81	2.80	15.07

as dep		post EBK	
0.665	4.522	0.79	5.226

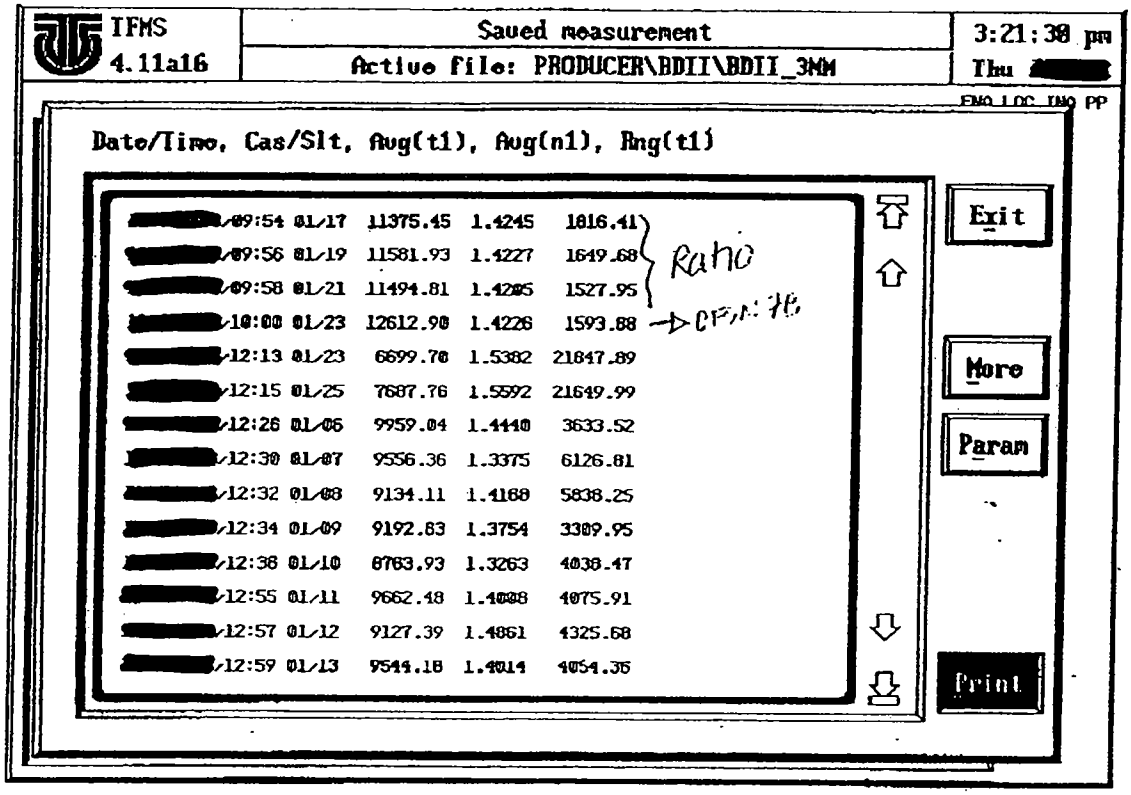
2.84	26.3
2.90	24.78
2.92	29.46
2.80458	36.97
2.8	39.3
2.77762	24.75
2.7883	25.32
2.80542	32.46
2.81393	21.97

	C2H4 No O2 600N2O AsDep C2H4	thick	DT	DR	range	unif	cpthick	cap	k	stress	C2H4 Post EBK No O2 600N2O Post EBK C2H4	thick	Del thick	shrink	shrinkU	range	unif	RI	cpthick	cap	k	stress
	0	11591.9	84	8280	1318	2.86	10675	51.53	2.82	19.020												
7NC1	250	10504.8	86	7329	883	2.19	10738	50.86	2.80	16.010												
7NC2	500	9817.41	90	6545	1000	3.9	10191	53.18	2.78	14.610												
7NC3	750	9388.72	94	5993	1365	5.21	9883	55.11	2.80	12.800												
7NC4	1000	9233.3	100	5540	1590	5.94	9796	55.66	2.80	11.760												
7NC5	2000	8601.75	120	4301	1772	6.71	9151	60.49	2.84	2.951												
7NC6	3000	8348.05	140	3578	1678	6.29	8972	63.11	2.91	-7.605												

0	2.81892	13.42	2.82	19.020
250	2.78373	14.98	2.80	16.010
500	2.80119	12.96	2.78	14.610
750	2.797	10.49	2.80	12.800
1000	2.81975	7.154	2.80	11.760
2000	2.86589	-6.156	2.84	2.951
3000	2.92134	-22.07	2.91	-7.605

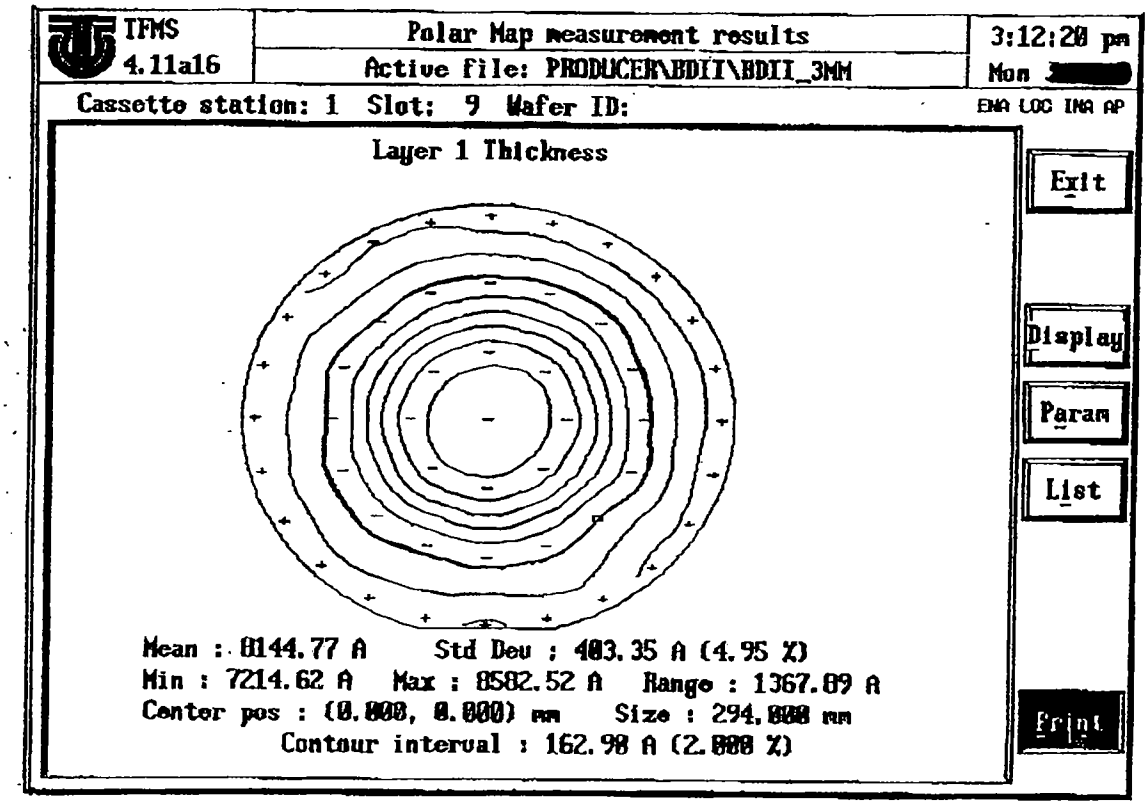
2.8341	42.36
2.8055	27.66
2.8159	20.95
2.8339	17.41
2.8371	17.73
2.8224	27.5
2.8175	15.1
2.8733	8.35
2.9349	5.668
2.9513	7.169
2.8611	20.1
2.8557	24.95
2.8294	5.795
2.8348	5.824
2.8478	12.52
2.8471	1.97

Exhibit A2



OP5340/59189/8249

Exhibit C



OP5340/59189/8249

	H	C	O	Si
asdep	28.8	25.1	20.2	25.9
Etch	27.1	25.5	21.6	25.8

Cp = 7214.62

stress = 21.17

Cap = 75.99

k = 2.81

As Dep

Ref Ox = 148.1

Tox 5131.5

N_2O = 100 sccm

O_2 = 110 sccm

ϕ-FS-N-16